Real-time Data Collection through Wearable Devices to Quantify Attributes Related to Health and Performance in Extreme Conditions

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***Abstract*— The goal of this project is to collect real-time data on attributes related to health and performance on an extreme task. We will leverage commercial off-the-shelf devices to collect physiological and human performance data in real-time while participants complete an operational task that evokes intense fatigue and has environmental changes (e.g., temperature and altitude). Specifically, through real-time data collection, we will utilize a diverse set of devices to test which attributes are most related to performance on the Rim-to-Rim hike at the Grand Canyon. Attributes such as hydration, oxygenation level, heart rate, cognitive ability, and other human dimension metrics may (or may not) be related to performance in extreme environments. One aim is to provide DTRA empirical evidence on what human attributes should be synthesized into a single device to monitor task performance and health status. Another aim relates to the concern with real-time data collection and data protection; we will focus on how to protect real-time data through cyber-based data protection and data encryption techniques. Leveraging Sandia National Labs' expertise in systems biology, systems engineering, cognitive science, human-subjects testing, data analysis, and cyber security, we aim to test devices that collect human performance data and examine how those attributes relate to success.**

Keywords— systems biology; physiology; cognition; performance; systems engineering; data encryption; data exfiltration

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